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STRATIGRAPHY AND PALEONTOLOGY OF THE DUNDEE LIMESTONE OF SOUTHEASTERN MICHIGAN

BY

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From a dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy in the University of Michigan.

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FIGURE 1. NORTHERN FACE OF THE QUARRY
All intervals of the Dundee are shown with the exception of "25" (author's section).

FIGURE 2. EASTERN FACE OF THE QUARRY

DUNDEE-ANDERDON CONTACT IN SIBLEY QUARRY

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BY CHARLES FERNANDO BASSETT

(Presented before the Paleontological Society, December 30, 1933)

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INTRODUCTION

STATEMENT OF THE PROBLEM

The purpose of this paper is to describe the Dundee limestone in southeastern Michigan so that sections in other parts of the state may be compared, both as to stratigraphy and as to fauna, with that of the type area. The name, Dundee, is generally used to designate all limestone beds occupying a stratigraphic position between the Detroit River

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group, composed largely of dolomites, and the overlying shales and limestones, assigned to the Traverse group. As these limestones are not

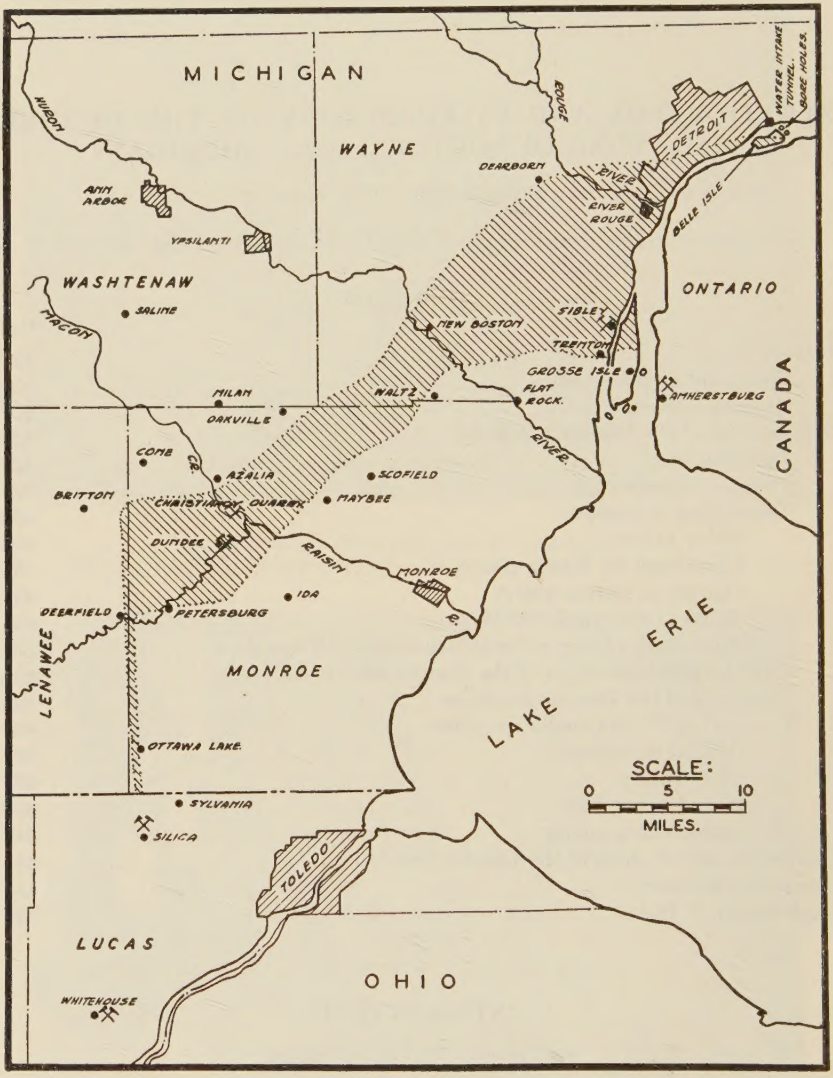

FIGURE 1.—*Areal distribution and location of Dundee limestone exposures*

of the same age in different parts of the state, the writer has made a careful study of the strata and the fauna of the type area. It is hoped that this information will help others in their work on the succession and the correlation of this formation.

ACKNOWLEDGMENTS

For aid in this investigation the author is greatly indebted to Professor G. M. Ehlers, of the University of Michigan; Professor J. E. Carman, of Ohio State University; Professor C. O. Dunbar, of Yale University; J. W. Foley, manager of the Solvay Process Company quarry at Sibley, Michigan, and F. Nill, manager of the Bruner Mond Canada Limited quarry at Amherstburg, Ontario.

STRATIGRAPHY OF THE DUNDEE LIMESTONE

DISTRIBUTION

The Dundee limestone of southeastern Michigan is at the surface or covered only by glacial drift, in a belt extending in a northeast-southwest direction through Wayne and Monroe counties, and thence southward along the boundary between Monroe and Lenawee counties. From Deerfield, in Lenawee County, south to the state line, through Monroe and Lenawee counties, the formation is restricted to a narrow belt having a nearly north-south strike. This narrow distribution is due largely to the relatively high westward dip of a monocline and, in lesser degree, to the thinning of the formation to the south. Northeast of Deerfield the strata have a low dip, which results in the wider areal distribution of the formation (Fig. 1).

PREVIOUS CLASSIFICATION

The strata now designated Dundee and the underlying dolomites were noted in 1838 by Douglass Houghton [1] in the bed of the Raisin River at Dundee, Monguagon, and Amherstburg. Bela Hubbard, who assisted Houghton in the study of the geology of Michigan, discussed these strata in 1839,[2] and in 1840 [3] he expressed the opinion that they were equivalent in position to the "cliff limestone" of Indiana. In 1861, Alexander Winchell [4] assigned them to the Upper Helderberg. Carl Rominger [5] described the Dundee strata of the Trenton (Sibley) and the Macon Creek (Christiancy) quarries, and included them in his "Helderberg Group." The term, Dundee Limestone, was used first in

[1] Douglass Houghton: *Report of State Geologist,* Michigan Legislature, House Doc. no. 24 (1838) p. 281-283; G. N. Fuller: *Geological reports of Douglass Houghton,* Mich. Hist. Comm., Lansing (1928) p. 103.

[2] Bela Hubbard: *Report of Bela Hubbard* in *Second Annual Report of the State Geologist,* Michigan Legislature, Senate Doc. no. 12 (1839) p. 361-362, 376, 378; G. N. Fuller: *Geological reports of Douglass Houghton,* Mich. Hist. Comm., Lansing (1928) p. 298-299, 318, 320-321.

[3] Bela Hubbard: *Report of Bela Hubbard* in *Third Annual Report of the State Geologist,* Michigan Legislature, Senate Doc. vol. 2, no. 7 (1840) p. 124; G. N. Fuller: *Geological reports of Douglass Houghton,* Mich. Hist. Comm., Lansing (1928) p. 445.

[4] Alexander Winchell: *First biennial report of the progress of the Geological Survey of Michigan,* Lansing (1861) p. 62.

[5] Carl Rominger: *Lower Peninsula,* Mich. Geol. Surv., vol. 3, pt. 1 (1876) p. 24.

1895 by A. C. Lane,[6] who stated that it was nearly equivalent to the Corniferous or Upper Helderberg. Since this date, geologists have followed Lane in using the name, Dundee.

DESCRIPTION OF SECTIONS

Sibley quarry.—About seventy feet of Dundee limestone are exposed in the Solvay Process Company's quarry at Sibley, about two miles north of Trenton, Wayne County, Michigan. The lowest beds of the Dundee in this quarry rest on the Anderdon limestone of the Detroit River group; the uppermost beds of the Dundee have been removed by pre-glacial and glacial erosion.

In his description of the section of Sibley quarry, given below, Sherzer[7] did not separate the Dundee limestone from the Anderdon limestone.

Sherzer's Sibley Quarry section

	Feet	Inches
Glacial drift		
Dundee		
A. Limestone, yellow, brown to gray; thin-bedded, very fossiliferous	6	0
B. Limestone, thin-bedded, gray to bluish	7	0
C. Limestone, compact, gray, rich in fossils	2	0
D. Limestone, compact, crystalline, bluish where unweathered	5	0
E. Limestone, compact, gray to blue, fossil fragments abundant	6	0
F. Chert, brittle, bluish gray, some fossils	1	2
G. Limestone, gray to bluish, more heavily bedded	6	0
H. Chert, very brittle, impure, some fossils	2	0
I. Limestone, compact, heavily bedded, blue to gray	9	0
J. Limestone, magnesian; similar to I but oily and fewer fossils	6	0
K. Limestone, gray, thin-bedded, fossiliferous	8	0
L. Limestone, magnesian, light to dark gray, fossiliferous. "Lower magnesian"	12	0
M. Limestone, siliceous, thin-bedded, firm, poor in fossils	7	0
	77	2

The writer's description of the Sibley Quarry section, given below, notes the contact between the Dundee and the Anderdon limestones, and shows the presence of beds below those exposed at the time of Sherzer's study (Pl. 33).

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[6] A. C. Lane: *The geology of lower Michigan with reference to deep borings,* Mich. Geol. Surv., vol. 5, pt. 2 (1895) p. 25-26.

[7] W. H. Sherzer: *Geological report on Wayne County, Michigan,* Mich. Geol. and Biol. Surv., Publ. 12, geol. ser. 9 (1913) p. 202.

Section of strata exposed at Sibley Quarry

	Feet	Inches
Glacial drift		
Dundee limestone		
25. Limestone, coarsely crystalline, light-gray to grayish-white to light buff-gray, becoming darker and more finely crystalline toward the top. *Paracyclas elliptica* Hall and *Spirifer lucasensis* Stauffer are common in this interval	24	8
24. Limestone, finely crystalline, gray, weathering to buff. Lower part contains much chert, which is often laminated. On the west side of the quarry the top of this bed forms the present upper floor level. Many fossils are present, the more characteristic being *Favosites hemispherica* (Troost), *Atrypa elegans* (Grabau), and *Atrypa elegans* var. *gibbosa* Bassett, n. var.	1	6
23. Limestone, granular with coarse coquina bands, buff-gray. Either this interval or interval 21 below contains the pelecypod *Actinodesma occidentale* (Hall) which is also found in the exposure along Macon Creek	6	0
22. Limestone, finely crystalline, buff-gray, containing bands of chert and chert nodules arranged in bands. Fossiliferous	2	0
21. Limestone, coarsely crystalline, grayish-white. Two feet above the base is a zone of *Cyrtina,* from one to two inches in thickness; at some places in the quarry this zone is absent as the result of styliolitic action. Very fossiliferous	8	0
20. Limestone, finely crystalline, gray, having a lumpy appearance when broken. Contains many small and well-preserved fossils		8
19. Limestone, coarsely crystalline, similar to interval 18 but darker in color		10
18. Limestone, finely crystalline, light buff-gray, with numerous small black specks. Small chert nodules scattered in the lower 1½ feet; styliolites abundant in the upper and the lower parts. Fossils uncommon	5	6
17. Limestone, medium coarsely crystalline, finer than interval 16, light pinkish to buff-gray; minute circular areas of crystalline calcite in the lower 22 inches; lower 41 inches somewhat more finely crystalline and more buff than above. At points, 22, 29, and 39 inches above the base, are layers of chert nodules. The limestone above the chert is light gray and contains numerous dissociated columnals of crinoids, which stand out in relief on the weathered surface of the rock. This limestone is massive in some places, and in others breaks up into a number of thick beds. The upper 1 foot 7 inches of this limestone is light gray and contains numerous shells of fossils. Very fossiliferous	9	7
16. Limestone, coarsely crystalline, gray, somewhat finer than below, and containing fewer fossils than interval 15	1	6

	Feet	Inches
15. Limestone, coarse grained in upper and lower parts, finer grained in middle part; buff-gray in color. Coarse-grained parts are fossiliferous coquina limestone. The presence of many dissociated columnals of crinoids gives the surface of the limestone a rough appearance. The upper part contains many shells of *Rhipidomella variabilis* Grabau, cup corals, and *Favosites hemisphericus* (Troost). In the lower part, shells of *Stropheodonta* are more abundant than those of *Rhipidomella*. The basal six inches of the interval is full of frosted quartz grains, which are sometimes concentrated in shallow depressions in the top of the underlying Anderdon limestone. This arenaceous band at the base of the interval is the basal sandstone of the Dundee limestone. Distantly spaced chert nodules are present a short distance above and below the juncture of the lower coarse and the middle finer grained parts....	10	2
Anderdon limestone		
14. Limestone, finely crystalline, light gray, generally unfossiliferous, but in some places a few impressions of a minute gastropod are found near the top of the bed.....	2	4
13. Limestone, finer grained in lower and upper parts; coarser grained, with some frosted sand grains, in the middle part; buff in color. Many carbonaceous laminae in the upper and the lower parts. Unfossiliferous.....	4	0
12. Limestone, finely crystalline, dark gray, from two to eight inches in thickness, containing small disseminated crystals of calcite. Unfossiliferous.....		8
11. Limestone, fine grained, light gray, unfossiliferous.....	4	0
10. Limestone, granular, dark buff at base to light buff-gray at top. Lowest three inches contains many carbonaceous laminae. Above this is a band, three to four inches in thickness, which contains molds of several species of pelecypods and small gastropods and a few species of brachiopods and cephalopods. These species are present in the rock above and below, but are less abundant. Most of the interval is characterized by digitate *Favosites,* and hemispherical and explanate stromatoporoids, in such abundance as to form a biostrome. A small, coarsely plicate *Atrypa* is fairly common in this biostrome.....	5	0
9. Limestone, granular, buff, composed of finely comminuted shells, locally cross-bedded in lower part. Contains many sand grains, especially in the cross-bedded part. Unfossiliferous.	5	0
8. Limestone, fine grained, light buff with numerous carbonaceous laminae. Unfossiliferous.....		3
7. Limestone, fine grained, gray-buff, separated into linear and wavy laminae by thin films of carbonaceous matter.		

	Feet	Inches
Upper three inches has small areas of dark gray limestone, some of which simulate pebbles. Many styliolites are present. Unfossiliferous	2	6
? Flat Rock dolomite		
6. Dolomite, finely crystalline, light buff, banded in light and dark shades of this color. Upper four inches has irregular, gray bands which are broken into angular fragments	1	3
FLOOR OF QUARRY		
(Intervals 1 to 5 exposed in old pump-hole.)		
5. Limestone, magnesian, fine grained, light buff-gray, on weathering shows layers one-half to four inches in thickness. Contains many small, irregular masses of calcite. Styliolites present. Unfossiliferous	1	0
4. Limestone, magnesian, coarser grained than 3, buff, with laminae of lighter and darker shades. Locally, the laminae are bent and fractured. Contains irregular masses of crystalline calcite. Unfossiliferous	4	0
3. Dolomite, exceedingly fine grained, light gray, on weathering shows mottling of pink or black. Unfossiliferous		6
2. Dolomite, fine grained, laminated, light to dark buff, with irregular shaped masses of calcite. Angular fragments of dolomite locally present in middle of bed. Unfossiliferous.	3	0
1. Limestone, magnesian, fine grained, dark to light buff, with some calcite geodes. Base below bottom of pump-hole	1	6
	105	5

A comparison of this section with that of Sherzer shows that Sherzer's interval M, which he considered as a part of the Dundee limestone, includes intervals 12, 13, and 14, which the present writer considers as belonging to the Anderdon. Sherzer's intervals J to F agree fairly well with 18 to 24 of the writer's section. It is obvious, therefore, that the two sections are much in agreement; the only major difference is the writer's assignment of Sherzer's interval M to the Anderdon and the consequent placing of the base of the Dundee at the base of Sherzer's interval L.

In the writer's section, 70 feet 5 inches of strata are assigned to the Dundee, 23 feet 9 inches to the Anderdon, and 11 feet 3 inches doubtfully to the Flat Rock. The assignment of the strata to the Dundee is based on the writer's study of the fauna. The beds included in the Anderdon contain a fauna distinct from that of the Dundee and related to the faunas of the Detroit River group. Although the beds designated as Anderdon have an appearance somewhat different from the Anderdon strata of the type locality, near Amherstburg, Ontario, the presence of the stromatoporoid-coral biostrome with the arenaceous beds both

above and below, in the Sibley quarry beds, and the similarity in thickness of these beds and the typical Anderdon have led the writer to agree with Nattress,[8] Sherzer and Grabau,[9] and Sherzer,[10] in believing that the beds below the Dundee at Sibley are equivalent to the Anderdon of the type locality. The lowest beds of the Sibley quarry are not Anderdon and are provisionally assigned to the Flat Rock dolomite, because this dolomite is said by Sherzer and Grabau [11] to underlie the Anderdon.

Christiancy, or Macon, quarry.—The Christiancy, or Macon, quarry is on the Bullock farm, in the floodplain of Macon Creek, about thirty miles southwest of Sibley Quarry and about two miles northeast of Dundee. The old quarry is largely filled, only the upper beds being visible. Lower beds are exposed along the stream, where the channel has been deepened for drainage purposes. Sherzer [12] described the rocks of the old quarry. This description, arranged in tabular form, is given below:

Sherzer's Christiancy Quarry section

	Feet
Glacial drift	
Dundee	
A. Limestone, rich, gray, abounding in fossils; relatively soft, glistens with cleavage faces of calcite, more or less thin bedded, and more or less shattered	1–2
B. Limestone, compact, brownish, becoming bluish on weathering; nearly without seam or divided into thick beds. Large fossils are not so abundant as above and the cleavage faces are smaller. The rock gives a strong bituminous odor and drops of oil are occasionally seen in fresh specimens. Toward the bottom the bed becomes somewhat cherty and in places there is interposed between this bed and the underlying bed C a seam of impure chert, varying in thickness from one to two inches. At the same horizon there is also to be seen in places a one-inch seam of blue clay, more or less charged with sand	4–4½
C. Limestone, soft, dark gray, either without seam or very heavily bedded	7–8
D. Limestone, similar to above, higher in $CaCO_3$	8
	20–22½

[8] Thomas Nattress: *The extent of the Anderdon beds of Essex County, Ontario, and their place in the geological column,* Mich. Acad. Sci., 13th Rept. (1911) p. 49; *Additional notes on the geology of the Detroit River area,* Mich. Acad. Sci., 14th Rept. (1912) p. 109-110.

[9] A. W. Grabau and W. H. Sherzer: *The Monroe formation of southern Michigan and adjoining regions,* Mich. Geol. and Biol. Surv., Publ. 2, geol. ser. 1 (1910) p. 46-47.

[10] W. H. Sherzer: *Geological report on Wayne County, Michigan,* Mich. Geol. and Biol. Surv., Publ. 12, geol. ser. 9 (1913) p. 200-201.

[11] A. W. Grabau and W. H. Sherzer: *op. cit.,* p. 41, 46.

[12] W. H. Scherzer: *Geological report on Monroe County, Michigan,* Mich. Geol. Surv., vol. 7, pt. 1 (1900) p. 75.

Correlation [13] of the beds of this quarry with the strata at Sibley quarry is shown below:

Christiancy Quarry (Sherzer's section)	Sibley Quarry (Sherzer's section)	Sibley Quarry (Author's section)
Bed A	Bed D	Bed 25 (in part)
Bed B	Bed E	Bed 25 (in part)
Impure chert	Bed F	Bed 24
Bed C	Bed G	Bed 23
Absent	Bed H	Bed 22
Bed D	Bed I	Bed 21

Dundee, or Pulver, quarry.—The Dundee, or Pulver, quarry is on the north bank of the Raisin River, back of the National Hotel in the village of Dundee, Michigan. It has been filled with water for over thirty years, and its strata were never seen and described by a geologist. From information given by Horace Pulver, the owner, and men who had worked for him, Sherzer's description [14] of the beds, tabulated by the present writer, is as follows:

Glacial drift Dundee	Feet	Inches
A. Limestone, rich, gray, impregnated with oil and full of fossils	2	6
B. Limestone, grayish brown having a bluish color on weathering, sparsely fossiliferous. Upper 15 inches irregularly clouded and "gnarled"	4	6
C. Limestone, dark brown, bituminous; becomes cherty in the lower 12 to 15 inches	6	6
Chert, light gray with brown streaks, impregnated with black oil; a discontinuous seam carrying silicified fossils		
D. Limestone, bluish, becoming lighter colored toward the base	5	0
	18	6

Sherzer [15] pointed out the probable relationships of the beds of this quarry to those exposed in the Christiancy quarry on Macon Creek. He thought that Bed A resembled Bed A of the Christiancy quarry, and that Bed B was apparently identical with Bed B of this quarry. The light gray chert with silicified fossils, which, according to Sherzer, occupies a position between intervals C and D of the Pulver quarry, was thought by Sherzer "to mark the same horizon as the similar seam in the Macon quarry and hence that Bed B there (Macon quarry) is the equivalent of Bed C in this (Pulver) quarry."

[13] W. H. Sherzer: *Geological report on Wayne County, Michigan*, Mich. Geol. and Biol. Surv., Publ. 12, geol. ser. 9 (1913) p. 202.

[14] W. H. Sherzer: *Geological report on Monroe County, Michigan*, Mich. Geol. Surv., vol. 7, pt. 1 (1900) p. 77.

[15] *Ibid.*

Shafts at Oakwood, Michigan.—The shafts of the Detroit Rock Salt Company's mine are in Oakwood, a small Detroit suburb, about one mile northwest of River Rouge (Fig. 1). The strata encountered in sinking the first shaft were studied by Sherzer,[16] who noted the presence of the Dundee and underlying formations as shown in the section below.

	Feet
Glacial drift	83
Dundee: high-grade limestone with some chert nodules	63
Lucas: bluish to brownish-gray dolomite, much of it finely laminated, with streaks of asphaltum. Small amount of gypsum. Poor in fossils	170
Amherstburg: brownish laminated dolomite	19
Anderdon: high-grade limestone, rich in fossils. Some celestite	38
Flat Rock: dark drab dolomite with few casts and molds of fossils. Some concretions and gypsum	47
	420

Sylvania and lower formations omitted.

In 1923 the Dundee limestone was exposed in a second shaft, put down by the salt company in close proximity to the first shaft. G. M. Ehlers, of the University of Michigan, collected several fossils from this limestone, which the writer has identified as follows:

Cyathophyllum dundeense Grabau
Rhipidomella variabilis Grabau
Stropheodonta sp. cf. *S. concava* (Hall)
Stropheodonta aff. *demissa* (Conrad)
Leptostrophia perplana (Conrad)
Chonetes maconensis Bassett, n. sp.
Pentamerella sp.
Atrypa costata Bassett, n. sp.
Atrypa elegans (Grabau)
Spirifer sp.
Cyrtina sp.
Conocardium subtrigonale d'Orbigny
Platyceras sp.
Proetus crassimarginatus Hall
Proetus planimarginatus Meek

Shore shaft of new water intake tunnel at Detroit.—The Dundee limestone was encountered, 1928 to 1930, during the construction of a new water intake tunnel at Detroit. A shaft was sunk near the bank of the Detroit River, at Waterworks Park. After reaching the Dundee limestone a tunnel was driven horizontally within it to a point beneath the Detroit River near the head of Belle Isle.

Ehlers collected information from this tunnel, and his unpublished description of the strata is given below.

	Feet	Inches
Filling (soil and rock)	20	0
Glacial drift		
14. Clay, yellow	2	0
13. Clay, blue, with small pebbles and some patches of sand	82	0
12. Clay ("hard pan" of engineers), stiff, bluish-gray, arenaceous, with numerous small pebbles and a few boulders. *Spirifer*		

[16] W. H. Sherzer: *Geological report on Wayne County, Michigan*, Mich. Geol. and Biol. Surv., Publ. 12, geol. ser. 9 (1913) fig. 21.

	Feet	Inches
bownockeri Stewart and a few other fossils, characteristic of Silica shale of Ohio found in clay	4	0
11. Clay, blue, with many blocks of limestone and a few boulders of igneous and metamorphic rocks. Numerous blocks, of bluish-gray, argillaceous limestone with *Silica shale fossils,* are present, especially nearer the base of the interval. These blocks were derived from thin layers of limestone within a bluish-gray shale. This shale, which rested on the shale of interval 10, was reduced to a clay by weathering, prior to the advent of the Wisconsin glacier; shearing planes in the clay indicate that the glacier squeezed this soft material	19	0
Hamilton group (possibly downward extension of Silica shale of Ohio)		
10. Shale, bluish-gray, with scattered crystals of pyrite and a few remains of *Chonetes* and ostracods	2	6
9. Shale, bluish-gray, with numerous disseminated crystals of pyrite. Numerous specimens of *Spirifer mucronatus* (Conrad) var., *Chonetes,* and *Phacops* sp.—very similar to, or identical with, *P. rana* var. *milleri* Stewart		6
8. Shale, bluish-gray, with scattered crystals of pyrite and a few small lenses (1 to 2 inches in thickness) of this mineral. Shale has a few oblique joints and a splintery fracture, tending to be parallel to the bedding	14	10
7. Shale, bluish-gray, with numerous disseminated crystals of pyrite. Remains of *Spirifer mucronatus* (Conrad) var., *Leptostrophia perplana* (Conrad), and ostracods in abundance. Cranidia and pygidia of *Phacops* present		8
6. Shale, bluish-gray, with scattered crystals of pyrite. Nodules of finely crystalline pyrite, 1 to 4 inches in length and one-half to 1 inch in thickness, are present in a band about 4 feet below top of interval. The lower part of this interval contains numerous remains of *Tropidoleptus carinatus typicalis* Williams and many other fossils of Hamilton relationships, noted by G. M. Ehlers and Mary E. Cooley[17]	15	6
5. Limestone, massive, crystalline, bluish-gray, containing simple corals, *Atrypa* sp., and *Tropidoleptus carinatus* Conrad	5	4
4. Limestone, crystalline, dark bluish-gray, crumbly, with some argillaceous bands and hydrogen sulphide-bearing water	2	6
Dundee limestone		
3. Limestone, massive, crystalline, buff, and fossiliferous, especially in lower part	4	2
2. Limestone, massive, crystalline, bluish-gray to buff-gray, and fossiliferous	7	0
1. Limestone, massive, crystalline, gray to buff-gray, and fossiliferous	5	4
	185	4

[17] G. M. Ehlers and M. E. Cooley: *Discovery of a Hamilton fauna in southeastern Michigan,* Univ. Michigan, Contr. Mus. Paleont., vol. 2, no. 13 (1927) p. 231-236.

A few fossils, collected from the Dundee limestone at this locality by Ehlers, have been identified by the writer as follows:

Prismatophyllum sp.
Stropheodonta aff. *demissa* (Conrad)
Leptostrophia perplana (Conrad)
Pholidostrophia iowaensis (Owen)
Chonetes sibleyensis Bassett, n. sp.
Productella spinulicosta Hall
?Etheridgina spinosa Bassett, n. sp.
Atrypa costata Bassett, n. sp.
Spirifer lucasensis Stauffer
Spirifer sp.
?Centronella sp.
Conocaridum subtrigonale d'Orbigny
Paracyclas elliptica Hall
Platyceras sp.
Bellerophon sp.
Poterioceras sp.
Proetus planimarginatus Meek

STRATIGRAPHIC BOUNDARIES OF THE DUNDEE LIMESTONE

Thus, the Dundee rests disconformably on the Anderdon limestone of the Detroit River group, except in the Oakwood salt shaft, and is overlain by a bluish-gray limestone of the Hamilton group.

According to Sherzer and Grabau,[18] the Dundee limestone rests on different members of the Detroit River group. The writer has examined the evidence cited by them for this unconformity and is not wholly in agreement. Several problems must be solved before a complete statement can be made regarding the beds which lie immediately below the Dundee limestone in southeastern Michigan and adjoining areas.

THICKNESS OF THE DUNDEE LIMESTONE

All of the strata of the Dundee are not exposed at any one place in southeastern Michigan. The greatest exposed thickness of Dundee strata, 70 feet 5 inches, is at Sibley quarry, where the base of the formation may be seen in contact with the Anderdon limestone. Although the complete thickness of the Dundee is not exposed in Sibley quarry, it is probable that the highest beds present are near the top of the formation, for the uppermost strata are lithologically similar to the Dundee beds underlying the blue limestone strata of the Hamilton group in the shore shaft of the new water intake tunnel. Probably the highest strata at Sibley are a continuation of the highest beds of the Dundee of the shore shaft, for the beds at both places are characterized by an abundance of *Spirifer lucasensis* Stauffer, *Chonetes sibleyensis* Bassett, n. sp., *Atrypa costata* Bassett, n. sp., and *Proetus planimarginatus* Meek.

The Dundee limestone becomes thinner in passing southward from the Sibley quarry region to Lucas County, Ohio, for certain beds of the Columbus, which are a continuation of the Dundee limestone, are

[18] A. W. Grabau and W. H. Sherzer: *The Monroe formation of southern Michigan and adjoining regions*, Mich. Geol. and Biol. Surv., Publ. 2, geol. ser. 1 (1910) p. 54.

only 20 feet thick where exposed in the quarries near Silica, Ohio. This thinning is not indicated by the records of a few wells drilled for oil in southwestern Monroe and southeastern Lenawee counties, on file in the office of the Michigan Geological Survey, because these records include higher and lower beds with the Dundee.

CORRELATION OF THE DUNDEE LIMESTONE

General statement.—The Dundee limestone of southeastern Michigan is lithologically and paleontologically (Table I) similar to a part of the Columbus limestone of the Silica and the Whitehouse quarries in Lucas County, Ohio, and the upper part of the Onondaga of the Bruner Mond Canada, Ltd., quarry at Amherstburg, Ontario.

Silica quarry.—The Silica quarry is operated by the Sandusky Cement Company at Silica, Ohio, about 20 miles southwest of Dundee, Michigan (Fig. 1). Carman's unpublished section of the strata exposed in this quarry is as follows:

"Blue limestone"	Feet	Inches
12. Limestone, blue, argillaceous, becoming shaly at top and bottom. Many fossils: *Atrypa reticularis,* simple corals, Pterinea-like pelecypod	1	0
11. Limestone, blue, crystalline, argillaceous (top of west face of quarry). Fossils: *Prismatophyllum davidsoni, Ceratopora flabellata, Cladopora roemeri, Cystiphyllum vesiculosum, Favosites hamiltonae, F. hemispherica, F. limitaris, F. radiciformis, Heliophyllum halli, Stromatopora nodulata, Atrypa reticularis, Cyrtina alpenensis, C. umbonata, Delthyris consobrina, Spirifer marcyi*	4	0
10. Limestone, shaly, weathering to clay, with thin partings of limestone	0	3
9. Limestone, firm, blue, finely crystalline, weathers brown. Fossils: *Prismatophyllum davidsoni, Cladopora roemeri, Favosites hemispherica, F. limitaris, F. placenta, Zaphrentis simplex, Stromatopora nodulata, Atrypa reticularis, Cyrtina alpenensis, C. umbonata, Delthyris consobrina, Spirifer audaculus, S. pennatus, Stropheodonta concava, S. perplana*	1	0
8. Limestone, blue-gray to brown-gray, crystalline, *Favosites* and some large *Chonetes coronatus* at base	0	10
7. Limestone, blue-gray, crystalline. Upper part contains *Chonetes coronatus.* Other fossils: *Favosites hemispherica, Idiostroma* sp., *Atrypa reticularis, Chonetes coronatus, Spirifer audaculus, S. marcyi, Stropheodonta hemispherica (?), S. perplana, Tropidoleptus carinatus, Paracyclas elliptica*	1	4

"Upper Columbus"	Feet	Inches
6. Limestone, blue or blue-gray, crystalline, in beds of 4 to 12 inches, with many fossils: *Productella spinulicosta* most characteristic; *Cyrtina umbonata* commonly abundant in lower and upper part of zone; Monotrypa-like bryozoan, *Atrypa reticularis, A. spinosa, Prismatophyllum davidsoni, Favosites* sp., *Spirifer lucasensis, S. manni, Cyrtina alpenensis, C. umbonata, Productella spinulicosta, Stropheodonta hemispherica*	5	0
5. Limestone, blue-gray to brown-gray, compact, with few fossils: *Paracyclas elliptica* most characteristic, *Cyrtina* sp. in lenses, *Atrypa spinosa*	3	6
4. Limestone, gray, crystalline, many fossils. Frond bryozoa most characteristic. Certain layers in upper part filled with *Cyrtina, Favosites* sp., *Ilionia* sp., *Conocardium cuneus*	2	6
3. Limestone, blue-gray to brown-gray, firm, crystalline, in layers 6 to 12 inches. Some fossils, including lenses of *Cyrtina,* in upper 2 feet. *Atrypa spinosa,* small *Conocardium*	5	6
2. Limestone, brown-gray to brown, soft, crystalline, fossiliferous: Protozoa, *Favosites* sp., frond bryozoa, *Cyrtina umbonata, Conocardium cuneus, Stropheodonta* sp.	3	6
"Lower Columbus"		
1. Dolomite, brown, even textured, in beds 1 to 3 feet	5	6
	33	11

The terms, "Lower Columbus," "Upper Columbus," and "Blue limestone," of the above section are terms used by Carman as a convenient method of separating these stratigraphic units in the field.

The correlation of the "Upper Columbus" limestone of this quarry with the Dundee limestone of southeastern Michigan is justified by the similarity of the faunas as shown in Table I.

Whitehouse quarry.—The quarry, worked by the Whitehouse Stone Company, just east of the town of Whitehouse, Ohio, is about eleven miles south, and a little west, of the Silica quarry (Fig. 1). Carman's unpublished description of the rocks of this quarry is as follows:

"Blue limestone"	Feet	Inches
12. Limestone, firm, dark-gray, compact, finely crystalline layer containing many corals. *Prismatophyllum davidsoni, Cladopora roemeri, Cystiphyllum vesiculosum, Favosites hemispherica, F. limitaris, Zaphrentis simplex, Z. prolifica* (?), *Monotrypa* sp., *Atrypa reticularis, Stropheodonta perplana.*	0	8
11. Limestone, dark gray, finely crystalline, breaking into layers of 1 to 2 inches. *Chonetes coronatus* in abundance	0	7

	Feet	Inches
Prismatophyllum davidsoni, Cladopora roemeri, Favosites hemispherica, Idiostroma sp., *Atrypa reticularis, Chonetes coronatus, Stropheodonta hemispherica, Conocardium cuneus.*		
"Upper Columbus"		
10. Limestone, dark-gray, slightly argillaceous, crystalline, breaks to uneven, lenticular slabs 1 to 2 inches thick. At places, very fossiliferous. Zone 8 of Stauffer's section.... *Prismatophyllum davidsoni, Favosites hemispherica, Atrypa reticularis, A. spinosa, Cyrtina umbonata, Spirifer lucasensis, Stropheodonta hemispherica, Conocardium cuneus, Paracyclas elliptica.*	2	0
9. Limestone, blue-gray to blue, dense. Only a few fossils. Zone 7 of Stauffer..... *Atrypa reticularis, A. spinosa, Spirifer lucasensis, Stropheodonta hemispherica, Paracyclas elliptica.*	1	6
8. Limestone, blue-gray, with *Cyrtina umbonata* abundant. Zone 6 of Stauffer..... *Cyrtina umbonata, Productella spinulicosta, Spirifer lucasensis, Stropheodonta hemispherica, Conocardium cuneus.*	1	0
7. Limestone, gray to blue-gray, crystalline, fossiliferous. *Cyrtina umbonata* present in upper 1½ feet. Zone 5 of Stauffer and lowest zone of "Upper Columbus"..... *Zaphrentis cornicula, Z. gigantea, Stromatopora ponderosa, Atrypa reticularis, A. spinosa, Cyrtina umbonata, Productella spinulicosta, Spirifer grieri* (?), *Stropheodonta demissa, S. hemispherica, Conocardium cuneus, Paracyclas elliptica, Callonema lichas, Pleurotomaria lucina, Orthoceras* sp., *Poterioceras* sp.	7	0
"Lower Columbus"		
6. Limestone, brown-gray, minutely crystalline; in uneven beds, 4 to 12 inches in thickness. A few fossils, of which *Tentaculites* is most characteristic. Zones 3 and 4 of Stauffer..	5	3
5. Limestone, brown-gray, finely crystalline; in uneven beds of 6 to 12 inches in thickness. Contains several lenses of white chert and at places a 4-inch layer at base. Zone 2 of Stauffer.....	2	6
4. Limestone, brown-gray, finely crystalline, in massive ledge. At places, contains chert nodules which weather out, leaving holes.....	4	6
3. Limestone, brown-gray, grainy; central part of zone contains chalky chert nodules in abundance, which have weathered out in some places.....	7	0
2. Limestone, dolomitic, brownish-gray to brown, slightly banded, grainy, crystalline. Upper 5½ feet, in massive ledge below which are ledges 2 to 3 feet thick, which break up in part to thinner layers. Basal 1 foot contains some sand grains.....	15	6
	47	6

TABLE I.—*Distribution of Dundee fossils in southeastern Michigan and in the Columbus or "Upper Columbus" of the Silica and the Whitehouse quarries, Ohio, and the Onondaga, of Amherstburg, Ontario*

Genera and Species	Occurrence (x–Collected by writer; c–Reported by Carman; s–Listed by Stauffer; ?–Doubtfully present in interval indicated)															
	Sibley Quarry															
	Intervals															
	Unknown	15	16	17	18	19	20	21	22	23	24	25	Christiancy	Silica	Whitehouse	Amherstburg
PORIFERA																
Astraeospongia sp.	x															
ANTHOZOA																
Cystiphyllum sp.	x															
Eridophyllum archiaci (Billings)	x															
Favosites hemisphericus (Troost)	x												x	x	x	s
Heliophyllum sp. cf. *H. halli* Edwards and Haime	x															s
Heliophyllum sp.	x															
Heterophrentis prolifica (Billings)	x															s
Pinnatophyllum dundeense Grabau	x															
Prismatophyllum sp similar to *P. anna* (Whitfield)	x													x		
BLASTOIDEA																
Nucleocrinus sp. cf. *N. verneuili* (Troost)	x															
BRYOZOA																
Cystodictya gilberti (Meek)				x			x	x		x	x			x	x	s
BRACHIOPODA																
Athyris sp.								x								
Atrypa costata Bassett, n. sp.												x	x	x	x	x
Atrypa ehlersi Bassett, n. sp.				x												
Atrypa elegans (Grabau)											x					
Atrypa elegans var. *gibbosa* Bassett, n. var.											x					
Camarotoechia nitida Kindle							x	x								
Chonetes maconensis Bassett, n. sp.							x				x		x			x
Chonetes sibleyensis Bassett, n. sp.									x	x		x	x			
Cyrtina hoffmeisteri Bassett, n. sp.				x			x		x	x	x	x				
Douvillina inequistriata (Conrad)							x				x					s
Etheridgina? spinosa Bassett, n. sp.				x			x	x								
Leptaena rhomboidalis (Wilckens)									x	x						
Leptostrophia perplana (Conrad)				x			x	x	x	x					x	x
Pentamerella parva Bassett, n. sp.								x								
Pentamerella sp.					x											
Pholidops neali Bassett, n. sp.							x		x	x						
Pholidostrophia iowaensis (Owen)				x	x		x			x		x		s	s	s
Productella spinulicosta Hall							x	x	x					x	x	
Rhipidomella variabilis Grabau				x				x		x				x	x	
Schizophoria foleyi Bassett, n. sp.				x												

Genera and Species	Occurrence (x–Collected by writer; c–Reported by Carman; s–Listed by Stauffer; ?–Doubtfully present in interval indicated																
	Sibley Quarry																
	Intervals																
	Unknown	15	16	17	18	19	20	21	22	23	24	25	Christiancy	Silica	Whitehouse	Amherstburg
Spirifer divaricatus Hall				x						x		x				
Spirifer sp. aff. S. *grieri* Hall	x														c	
Spirifer lucasensis Stauffer				x					x			x	x	x	x	x
Spirifer manni Hall	x													s	s	
Stropheodonta sp. aff. *S. concava* (Hall)	x													x		s
Stropheodonta sp. aff. *S. demissa* (Conrad)	x												x	x	x	s
Stropheodonta sp. aff. *S. hemispherica* Hall	x													x	x	s
Stropheodonta patersoni Hall	x															
LAMELLIBRANCHIATA																
Actinodesma occidentale (Hall)	x							?		?			x		s	
Conocardium subtrigonale d'Orbigny				x			x	x		x				x	x	s
Panenka sp. aff. *P. grandis* Whiteaves	x															
Paracyclas elliptica Hall												x	x	x	x	s
Pterinea flabellum (Conrad)	x													s	s	
GASTROPODA																
Bellerophon sp. cf. *B. pelops* Hall					x											
Hormotoma? sp.	x															
Platyceras sp. cf. *P. attenuatum* Hall							x									
Platyceras bradleyi Bassett, n. sp.				x												
Platyceras carinatum Hall				x			x	x							s	
Platyceras dumosum Conrad				x			x	x			x	x		x	s	
Platyceras keoughi Bassett, n. sp.				x			x									
Platyceras knappi Bassett, n. sp.	x															
CONULARIDA																
Coleolus sp. cf. *C. crenatocinctus* Hall							x								s	
Tentaculites sp. cf. *T. bellulus* Hall							x		x							
Tentaculites scalariformis Hall							x		x			x	x		s	s
CEPHALOPODA																
Centroceras ohioense (Meek)	x															
Poterioceras amphora (Whitfield)	x															
CRUSTACEA																
Chasmops calypso Hall and Clarke	x															
Coronura denticulatus (Conrad)	x				?											
Phacops sp.				x			x	x	x							
Proetus crassimarginatus Hall				x			x				x		x		s	
Proetus planimarginatus Meek		x		x			x	x		x				x	x	
Proetus sp.	x															

The "Lower Columbus" rests disconformably on the Lucas dolomite, which is noted in interval 1 in Carman's section. The detailed description of this interval is omitted in the above section.

In this quarry there is no lithologic change between the "Upper Columbus" and the overlying "Blue limestone." Carman considers the contact between these formations as being at the base of the bed containing *Chonetes coronatus* (Conrad) (interval 11), which is probably equivalent to the strata of intervals 7 and 8 of the Silica quarry.

The top of the Columbus limestone was correlated by Stauffer [19] at the top of his interval 5, which corresponds to the top of Carman's interval 7, and is 4 feet 6 inches below the top of Carman's "Upper Columbus." Stauffer reports *Cyrtina umbonata alpenensis* Hall and Clarke as making its appearance in overlying interval 6, and being present with *Chonetes coronatus* (Conrad) in interval 8. During a brief visit to the quarry with Carman, the writer was unable to find any specimens of *Cyrtina umbonata alpenensis* Hall and Clarke or of *Chonetes coronatus* (Conrad) in Stauffer's interval 8. The writer agrees with Carman in believing that the fauna of Stauffer's intervals 6-8 (Carman's intervals 8-10) is the same as that of the underlying beds, and that the top of the "Upper Columbus" should be placed at the top of Stauffer's interval 8 (Carman's interval 10).

The correlation of the "Upper Columbus" limestone of this quarry with the Dundee of southeastern Michigan is justified by the similarity of faunas, shown in Table 1.

Amherstburg quarry.—About six miles southeast of Sibley, and one mile north of Amherstburg, Ontario, Canada, is a quarry operated by the Bruner Mond Canada Limited (Fig. 1). The strata of the quarry were described by Stauffer [20] as follows:

	Feet	Inches
16. Soil and drift	5	0
Onondaga limestone		
15. Limestone, fairly compact, greyish brown, in layers from 1 to 2 feet in thickness	10	8
14. Limestone, earthy grey to brown, rather thin-bedded, with much fossiliferous grey chert	3	3
13. Limestone, semi-crystalline, grey, full of fossils, and comparatively thin-bedded	3	0
12. Limestone, compact, earthy, massive to semi-crystalline, grey, with few fossils and rather thick bedded	4	9

[19] C. R. Stauffer: *The Middle Devonian of Ohio,* Ohio Geol. Surv., Bull. 10, 4th ser. (1909) p. 149-150.

[20] C. R. Stauffer: *The Devonian of southwestern Ontario,* Canada Geol. Surv., Mem. 34 (1915) p. 202-203.

	Feet	Inches
11. Limestone, rather massive, semi-crystalline, grey, full of fossils	3	4
10. Limestone, semi-crystalline, slightly banded, grey to brown, with few fossils and in beds about 20 inches in thickness	5	9
9. Limestone, saccharoidal, brown, magnesian, with very few fossils. This is often one massive bed, but shows styliolites along the obscure bedding planes. Sometimes this part of the formation is separated into two, three, or even half a dozen beds. Pockets of calcite crystals occur in this rock	8	0
8. Limestone, very massive, grey to brown, saccharoidal, magnesian, containing occasional pockets of calcite crystals and a little fossiliferous chalky white chert, about three feet from the bottom. Except for the cherty nodules, these beds are very poor in fossils. They rest unconformably on the Anderdon beds and usually show a basal conglomerate which often includes some sand	10	8
Anderdon beds		
7. Limestone, compact, drab, with numerous fossils. A large loosely coiled gastropod is usually very conspicuous on the eroded surface. The sand, above mentioned, has often sifted down into the cracks of these and the beds below, and may occasionally be found in considerable quantity even to a depth of 4 or 5 feet	0	6
6. Limestone, semi-crystalline, grey with very few fossils	2	0
5. Limestone, semi-crystalline, grey, with an abundance of fossils. Corals and stromatoporoids are most abundant	4	8
4. Limestone, compact, banded, drab, with conchoidal fracture, emitting a semi-metallic ring when struck with a hammer	18	0
Flat Rock dolomite ?		
3. Limestone, brown, magnesian, in one layer. This forms the base of the larger part of the deep cut of the quarry. It contains a few corals and stromatoporoids	2	2
2. Limestone, indistinctly banded, rough, thin-bedded, with crinoidal stems and fragments	1	10
1. Limestone, compact, drab, rough and irregular. The top of these beds is sometimes very irregular and has a shale parting between it and the overlying rock. Corals and stromatoporoids are rather common in it	2	6
	85	1

Although the writer did not have an opportunity to make an extensive collection of fossils from this quarry, the strata of intervals 10 to 15 certainly have the same fauna as the Dundee limestone as shown in Table I.

The beds of the Amherstburg quarry, designated as Onondaga, the Dundee limestone of southeastern Michigan, and the "Upper Columbus" of northwestern Ohio, contain many species of fossils which have also

been reported from the Jeffersonville limestone of southern Indiana and Kentucky. The fauna of these various formations, as pointed out by Pohl,[21] migrated northward from the Gulf of Mexico region.

SYSTEMATIC PALEONTOLOGY OF THE DUNDEE LIMESTONE[22]

ANTHOZOA

Order TETRACORALLA

Pinnatophyllum Grabau ms.

The following description of this new genus is taken from an unpublished manuscript in the possession of the Michigan State Geological Survey, and is reproduced here by permission of that organization.

"Corallum conical, curved, curvature often approaching or even exceeding 90 degrees. Regularly expanding in normal specimens, and only in extreme forms becomes cylindrical in the ephebic stages. Gerontic stages often marked by contractions and periodic rejuvenescense. The pinnate arrangement of the septa is well shown on the exterior, the cardinal septum always occupying the outer or convex curve except in case of distortion. Excessive development of the septa in the cardinal quadrants may lead to an angulation along the line of the cardinal septum.

"Septa more or less radiate, often uniting in the more primitive species and somewhat twisting in the center. Dissepiments abundant, forming cystose structure arranged in the more primitive species in a cup like manner clearly similar to their arrangement in *Cystiphyllum*. In more specialized species they tend to form irregular more or less horizontal series approaching tabulae. In some extreme forms at present included here, tabulae are developed. The fossula is absent in the primitive species, but becomes developed to a moderate extent in the adults of the more specialized types. In extremely specialized types carinae may appear.

"This genus at present includes the following species:

Pinnatophyllum dundeense Grabau	Genotype—Dundee gr.
Pinnatophyllum multilamellatus	Columbus gr.
Pinnatophyllum scyphus	Traverse gr.
Pinnatophyllum zenkeri(?)	Hamilton

"These forms are bound together by community of descent and share in common the primitive curved conical form and persistence of pinnate arrangement of the septal grooves. The abundance of cystose structure is also a characteristic feature and indicates that this generic type by suppression of the septa might give rise to *Cystiphyllum;* or else that it was derived from a primitive *Cystiphyllum*-like type by the development of septa. It forms a connecting link between the primitive *Streptelasmas* and true *Cyathophyllums.*"

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[21] E. R. Pohl: *Devonian formations of the Mississippi basin,* Tennessee Acad. Sci., Jour., vol. 5, no. 2 (1930) p. 55, 58.

[22] Fossils listed in Table I which have been described and illustrated previously are not discussed in this paper.

Pinnatophyllum dundeense Grabau ms.

(Plate 34, figures 1-4)

1850. Cf. *Cyathophyllum michilin* Verneuil and Haime, Soc. Géol. France, Bull., 2nd ser., tome VII, p. 161.

1875. *Zaphrentis prolifica* Nicholson (not Billings), Ohio Geol. Surv., Paleont., pt. II, p. 237.

Pinnatophyllum dundeense Grabau, unpublished manuscript in possession of Michigan State Geological Survey, p. 42-46.

Grabau's description: "Corallum a short curved cone, the curvature being 90 degrees or over and the expansion varying from about 45 degrees in the narrower to nearly 60 degrees in the broader specimens. The greatest diameter of the calyx observed is 1¾ inches with a length of 3¼ inches; giving a dorso-ventral divergence of about 30 degrees.

"The epitheca is rather thin, the corallum being characterized by a number of coarse growth wrinkles due to repeated contraction and expansion. These are never marked enough to interfere with the symmetrical expansion of the corallum. The septal grooves are generally well marked; often the thin outer edges of the septa themselves are visible. The cardinal septum, so far as observed, is always on the convex side and symmetrical with reference to the curvature. The pinnate arrangement of septa is well shown. In this respect the coral closely recalls the more conate mutations of *Cyathophyllum scyphus* Rominger.

"The aperture is in a plane practically parallel to the axis of the young corallum; in some cases it may actually be somewhat overturned, while in others it does not quite reach that angle.

"The septa are numerous, alternating and numbering from 100 to 130 in a calyx 1½ inch in diameter. The last cycle septa reach half way or less to the center. Coalescence of the larger septa near the center is common, and they generally are deflected and more or less twisted. The cardinal septum is well-developed, the fossula being undeveloped. At the periphery the thickening of the septa has produced a pseudotheca 0.5 mm. or more in thickness. Dissepiments are numerous, often cystose and arranged more or less parallel to the wall in outer zones of the corallum. Frequently there are distinct cysts, with convexity pointing toward the center of the calyx. In this respect they resemble the cysts of *Cystiphyllum*. Near the center the dissepiments sometimes become horizontal and thus form the beginnings of tabulae. Typical tabulae are absent altogether. In the specimen with a calcinal diameter of 35 mm. the depth of the calyx is nearly 20 mm.

"This species approaches *Cyathophyllum* in the number of its septa, the absence of tabulae, and the abundance of cystose dissepiments. It differs from that genus in the lack of radial development of the septa and the marked bilaterality.

"This species has generally been identified as *Zaphrentis prolifica* Billings, but it differs from that species in its regular curvature and uniform expansion and the regular position of the cardinal septum, and in the more numerous development of septa. The absence of a fossula is another characteristic feature distinguishing this species from *Z. prolifica* Billings.

"From *Cyathophyllum zenkeri* Billings it is distinguished by its stronger curvature, more rapid expansion, and the less accentuation of the cardinal septum which in that species often causes a distinct angulation of the dorsal-ventral side of the corallum.

"*C. zenkeri* Billings is also more slender, especially in the adult, the septa are more radial and not coalescing, and the fossula is well developed generally in the adult. The young of *C. zenkeri* Billings is closely similar to *P. dundeense*.

"This and the next species [*Cyathophyllum multilamellatum* (Nicholson)—Grabau manuscript] may perhaps be regarded as forming a connecting link between *Streptelasma* on the one hand and *Cyathophyllum* on the other. Nicholson described this species as *Zaphrentis prolifica* Billings. This is shown by much of the original material from Ohio in the Columbia University collection, all of which is labelled by this name. Some small specimens from Sylvania, Nicholson referred doubtfully to *C. michilin* Verneuil and Haime. Nicholson's specimens came from Marblehead, Sandusky, Kelly's Island, and Columbus, Ohio.

Horizon and localities.—"In Michigan: Dundee limestone, Sibley quarry; 9 ft. bed (Sherzer's interval I), bottom 20 ft., 6 ft. bed, flint rock over 9 ft. bed (Sherzer's interval H); in Ohio, Columbus limestone. A typical specimen in the Calcisphaera limestone."

BRACHIOPODA

Order Inarticulata

Pholidops neali Bassett, n. sp.

(Plate 34, figs. 5-7)

Description.—Shell, small, ovate, greatest width posterior to center and about in line with apex; apex, located one-third the distance of the length of the shell from the posterior end. In early growth stages the apex is more nearly in the center of the shell. Shell, thin, marked by closely arranged lines of growth, which are crowded on the posterior end. Edge of shell, flattened.

Interior has a shield-shaped muscular impression. On each side of the median line of the shield, anterior to the apex of the shell, are two oval protuberances of the shell for the attachment of muscles. The muscle scar of this species differs from that of *P. hamiltonae* Hall as may be seen in figures 7 and 8 of Plate 34. The muscular impression of one specimen is similar to that of *P. oblata* Hall.

The dimensions of the holotype are: length, 3 millimeters; width, 2½ millimeters.

Occurrence.—Found in intervals 20, 22, and 23 of Sibley quarry. Another species of *Pholidops* is reported from the Amherstburg quarry. Further study may prove this to be the same as *P. neali*.

Order Articulata

Rhipidomella variabilis Grabau

(Plate 35, figures 1-4)

1913. *Rhipidomella variabilis* Grabau, Geol. Rept. on Wayne County, Michigan, Mich. Geol. and Biol. Surv., Pub. 12, geol. ser. 9 (1913) p. 342.

As far as the writer is aware this is the first time that this species has been illustrated. All attempts to locate the types were unsuccessful, but the description is adequate to recognize the species. The forms reported from Silica, Whitehouse, and Amherstburg quarries as *R. vanuxemi* Hall are the same as this species.

Occurrence.—Intervals 17, 21, 23 of Sibley quarry.

Schizophoria foleyi Bassett, n. sp.

(Plate 35, figure 5)

Description.—Shell, subquadrangular; cardial extremities, rounded; hinge-line, about one-half the greatest width of the shell. Width of holotype, 28 millimeters; length, 22 millimeters.

Ventral valve, convex; the shallow, undefined sulcus starts at the beak and becomes broader and deeper toward the front; beak, incurved over the concave palintrope; delthyrium, equilaterally triangular, open; the cast of an interior shows that the dental plates were extended as a ridge around the deeply bilobate muscle area, one side of which consisted of at least two lobes.

Dorsal valve, seen only in a young specimen; regularly convex from beak to front; convexity greater than in the ventral valve. Surface, multicostellate.

Remarks.—This specimen is much like the specimen from the Sellersburg bed of Indiana, illustrated by Kindle[23] as *S. striatula* (Schlotheim). It does not look like typical examples of *S. striatula* (Schlotheim) nor like specimens referred to this species. It is quite possible that Kindle's specimen should be identified as *S. foleyi* Bassett, n. sp.

In Indiana the species referred to as *S. striatula* (Schlotheim) is associated with, and less common than, *Rhipidomella vanuxemi* Hall. Likewise, in the Sibley quarry, *Schizophoria foleyi* Bassett, n. sp., is associated with *Rhipidomella variabilis* Grabau, and is less common than the latter. The species reported from the Whitehouse and Amherstburg quarries as *S. striatula* (Schlotheim) may prove to be the same as this new species.

Occurrence.—Interval 17, Sibley quarry.

Genus *Stropheodonta*

This genus is common in the Dundee limestone of the Sibley quarry and is represented by a number of species. The shells are so poorly preserved in most cases that positive identification is impossible. Grabau notes the occurrence of the following species in the Dundee limestone of southeastern Michigan: *Stropheodonta inequiradiata* Hall, *S. dundeense* Grabau, *S. hemispherica* Hall, *S. concava* (Hall), *S. costata* Owen, *S. fissicosta* Winchell, *S. demissa* (Conrad), and *S. alpenensis* Grabau. Of these, only forms which may be referred to *S. hemispherica, S. concava,* and *S. demissa* have been observed by the writer. Specimens of *S. dundeense* Grabau are undoubtedly in the collection, but they could not be separated on the basis of the description, and the types could not be located.

Chonetes maconensis Bassett, n. sp.

(Plate 35, figures 6-10)

Description.—Shell, small, semi-oval in outline, concavo-convex; hinge-line, about equal to the greatest width of the shell; cardinal extremities, sometimes salient. The dimensions of the holotype are: length, 7 millimeters; width, 11 millimeters.

Ventral valve, regularly convex from beak to front, abruptly flattened on the cardinal extremities.

Dorsal valve is moderately concave.

[23] E. M. Kindle: *The Devonian fossils and stratigraphy of Indiana,* Ind. Dept. Geol. and Nat. Res., 25th Ann. Rept. (1900) pl. 3, figs. 11, 11a.

Plications, coarse, about twelve in the vicinity of the beak. Approximately four of these bifurcate about one-third of the distance from the beak to the front, and about four close to the front of the shell, making about twenty plications at the border. The plications are wider than the interspaces. No plications are present on the flattened postero-lateral parts of the shell.

The cardinal margin shows two spines on each side of the center, which are abruptly bent outward, nearly parallel with the margin.

Remarks.—This species is similar to *C. mucronata* Hall, but differs from it in being a little more convex, in having striae wider than the interspaces, and in showing a greater bifurcation of the striae. The species is much like *C. laticosta* Hall, which Hall considered the same as *C. mucronata* Hall, but the ventral valve is not gibbous, and the striae differ in the same particular as above.

Occurrence.—Intervals 20 and 24, Sibley quarry, Macon Creek, Amherstburg.

Chonetes sibleyensis Bassett, n. sp.

(Plate 35, figures 11-14)

Description.—Shell, semi-elliptical in outline; average length, 11-12 millimeters; breadth, 14-15 millimeters.

Ventral valve, strongly convex, depressed toward the cardinal angles. Surface, marked by rounded plications, which increase by bifurcation and intercalation so that 40 to 50 may be counted at the margin. Plications and interspaces about equal in width. There is considerable space at the cardinal angles, which is destitute of striae. Four spines are present on each side of the beak and are abruptly bent outward, parallel with the hinge-line.

Dorsal valve, slightly concave, with markings which correspond to those on the ventral.

Specimens from the chert beds of the Dundee limestone seem to be a little less convex, and the plications do not appear as conspicuous.

Remarks.—This form is similar to *C. vicinus* (Castelnau), *C. deflecta* Hall, and *C. gibbosa* Hall, but has a larger number of plications.

Occurrence.—Intervals 22, 23, and 25, Sibley quarry, Macon Creek.

Etheridgina? spinosa Bassett, n. sp.

(Plate 35, figures 15-22)

Description.—Shell, small, attached to foreign objects, for a part of its life at least, by a small cicatrix on the umbo of the ventral valve; wider than long, semi-elliptical or semi-circular in outline; hinge-line, a little shorter than the greatest width of the shell; no cardinal area on either valve. The dimensions of an adult are: length, 10 millimeters; width, 12 millimeters.

Ventral valve has scar of attachment, although no specimen was found adherent to another object. There are spines along the hinge-line and spines, arranged concentrically about the scar of attachment, extending out on the wrinkled postero-lateral slopes; the three rows of spines close to the scar are crowded, the others being successively farther apart toward the front of the shell. The spines alternate in position in the rows. Toward the front each spine occupies the midpoint of a ridge which rises from the shell in back and disappears toward the front. This character, especially when the minute scar of attachment is scarcely apparent, gives the specimens an appearance on the front part of the ventral valve, similar to that of *Productella spinulicosta* Hall.

Dorsal valve, known only from one interior; concave, with a broad flattening posterior to the middle; granulose; diductor muscle scars, present.

Remarks.—This species somewhat resembles species of *Strophalosia* and *Leptalosia,* but differs from these genera in the absence of a cardinal area. The specimens illustrated were submitted to Carl O. Dunbar, of Yale University. In his opinion this form is closely allied to the genus *Etheridgina.*

Occurrence.—Intervals 17, 20, and 21, Sibley quarry.

Pentamerella parva Bassett, n. sp.

(Plate 35, figures 23-25)

Description.—Shell, small, subcircular in outline, width and length about equal; hinge-line, shorter than the greatest width of the shell. The dimensions of the holotype are: length, 13 millimeters; width, 14 millimeters.

Ventral valve, gibbous, regularly convex from beak to front, without a definite sulcus; beak, incurved over the palintrope.

Dorsal valve, slightly convex without a definite fold.

Surface marked by 12 or 13 plications.

Remarks.—The holotype, the only specimen found, is almost entirely exfoliated; hence, the external ornamentation of the shell is unknown.

Occurrence.—Interval 21, Sibley quarry.

Atrypa elegans (Grabau)

(Plate 36, figures 1-15)

1911. *Atrypa reticularis* mut. *elegans Grabau,* Mich. Geol. Surv., Publ. 12, geol. ser. 9 (1913) p. 344.

Description.—Shell subcircular in the younger individuals, but, because of more rapid growth in the anterior portion, becomes oval in the adult stage; hinge-line, about two-thirds the width of the shell. Dimensions of the neohelotype, which is almost entirely exfoliated, are: length of ventral valve, 17 millimeters; length of dorsal valve, 16 millimeters; greatest width, 15 millimeters; estimated length of hinge-line, 10 millimeters; thickness, about 11.5 millimeters. Dimensions of a well-preserved neoparatype are: length of ventral valve, 20 millimeters; length of dorsal valve, 18.5 millimeters; greatest width, 18 millimeters; length of hinge-line, 12 millimeters; thickness, 14 millimeters.

Ventral valve, depressed-convex, greatest depth posterior to the middle; umbo, prominent, with the surface sloping abruptly to the cardinal margins; sulcus is only a slight depression toward the front of the shell, which, in gerontic individuals, becomes produced into a linguliform extension of the shell; beak, small and produced posteriorly beyond the hinge-line, nearly in line with the plane of the valve, only slightly incurved.

Dorsal valve, gibbous, without a fold except as indicated at the anterior edge of the shell; greatest depth, in the center of the valve, from which point the shell curves regularly to the margins; beak, small and incurved under that of the ventral valve.

Surface of each valve is covered by fine plications, which increase by bifurcation and intercalation until about 70 are present at the margin of a mature shell. Concentric lines of growth are present but not prominent on most shells.

Remarks.—Grabau differentiated this form from *Atrypa reticularis* (Linnaeus) by means of its smaller size and finer plications. In the writer's opinion this

mutation is specifically different from *Atrypa reticularis* (Linnaeus) and should be raised to the rank of a species.

Occurrence.—Interval 24, Sibley quarry.

Atrypa elegans var. *gibbosa* Bassett, n. var.

(Plate 36, figures 16-21)

Description.—Shell, globular in form, subcircular in outline; hinge-line, about half the width of the shell. The dimensions of the holotype are: length of ventral valve, 17 millimeters; length of dorsal valve, 15 millimeters; greatest width, 18 millimeters; length of hinge-line, 8 millimeters; thickness, 13 millimeters.

Ventral valve, arched in the lower half, but abruptly depressed anterior to the middle into a sulcus which increases in depth toward the front, where it is produced into a linguliform extension; umbo, prominent, with the surface sloping abruptly to the cardinal margins; beak, small, only slightly incurved, and produced posteriorly beyond the hinge-line, nearly in the plane of the valve observed.

Dorsal valve, gibbous, the greatest depth being at the middle of the valve; mesial fold, pronounced and corresponding to the sulcus in the opposite valve; beak, incurved under that of the ventral valve.

Plications increase by intercalation, and possibly bifurcation, until about 40 are present at the margin of the shell.

Remarks.—This variety differs from *A. elegans* (Grabau) in having a pronounced fold and sulcus, and a smaller number of plications.

Occurrence.—Interval 24, Sibley quarry.

Atrypa costata Bassett, n. sp.

(Plate 37, figures 1-10)

Description.—Shell, oval in outline; hinge-line, a little more than half the greatest width of the shell. The dimensions of the holotype are: length of ventral valve, 20 millimeters; length of dorsal valve, 19 millimeters; greatest width 18 millimeters; length of hinge-line, 12 millimeters; thickness, 13.5 millimeters.

Ventral valve, depressed-convex; toward the front is developed an ill-defined sulcus, which becomes a linguliform extension of the shell in gerontic individuals; umbo, rather prominent; beak, only slightly incurved, and produced posteriorly beyond the hinge-line nearly in the plane of the valve.

Dorsal valve, gibbous, with a fold corresponding to the sulcus in the opposite valve; beak, inconspicuous and incurved under that of the pedicle valve.

Valves marked by costae, which bifurcate high up on the shell; 25 to 30 are usually present at the edge of the shell. The costae are crossed by prominent lines of growth, which make the shell look somewhat like *A. spinosa* Hall. In the young stages the shells are flatter, semicircular in outline, and do not possess a fold and sulcus. In gerontic individuals the shell becomes much thickened, and the growth lines imbricated.

Remarks.—This is a common form of *Atrypa* found in the Sibley quarry, and is probably the form which Grabau identified as *A. spinosa* Hall.

Occurrence.—Interval 25, Sibley quarry; Amherstburg quarry.

Atrypa ehlersi Bassett, n. sp.

(Plate 37, figures 11-14)

Description.—Shell, subcircular in outline; hinge-line, less than half the greatest width of the shell. The dimensions of the holotype are: length of ventral valve, 20 millimeters; length of dorsal valve, 19 millimeters; greatest width, 18 millimeters; length of hinge-line, 8 millimeters; thickness, 11.5 millimeters.

Ventral valve, depressed-convex; front, produced into a shallow sulcus; umbo, prominent; beak, small, slightly incurved over that of the dorsal valve.

Dorsal valve, convex, regularly arched, with a slight fold corresponding to the sulcus in the opposite valve; beak, incurved under that of the ventral valve.

Costae are coarse, and increase by bifurcation and intercalation until there are from 22 to 26 at the edge of the shell. These are crossed by concentric, lamellose lines of growth, some of which are more prominent than others.

Occurrence.—Interval 17, Sibley quarry.

Genus *Spirifer*

This genus is not represented by many specimens in the beds at Sibley quarry. Most of the specimens found by the writer consist of single valves in a fragmentary state of preservation, making definite identifications of all species impossible.

Cyrtina hoffmeisteri Bassett, n. sp.

(Plate 37, figures 15-19)

Description.—Shell, small, subpyramidal in form; hinge-line, a little shorter than the greatest width of the shell; cardinal extremities, subangular. The dimensions of the holotype are: length of ventral valve, 11 millimeters; length of dorsal valve, 7.5 millimeters; width, 10 millimeters; thickness, 10.7 millimeters; height of cardinal area, 5.8 millimeters.

Ventral valve, subpyramidal, with the apex slightly incurved or erect; uniform curvature from the beak to the front and cardinal angles; sulcus, rather shallow, originating at the beak, angular in the bottom; interarea, high, flat, or slightly incurved; delthyrium, high, narrow, and covered by a convex pseudodeltidium; each lateral slope, marked by about six simple costae, the two bounding the sulcus being much the strongest.

Dorsal valve, depressed-convex, shallow, compressed toward the cardinal extremities, the greatest convexity, near the middle; mesial fold, low, moderately elevated as it approaches the frontal margin and having a slight mesial depression; each lateral slope, marked by six costae.

In addition to the costae on both valves, there are faint lines of growth, which are crowded toward the front.

Remarks.—Some of the specimens show injuries which caused a halt in the growth on one side of the beak of the ventral valve, giving it the twisted appearance of *C. hamiltonensis* Hall. The specimens of *C. hoffmeisteri* Bassett, n. sp., from the Dundee of Sibley quarry, differ from specimens of *C. hamiltonensis* Hall collected at Widder, Ontario, in being smaller, and in having a less convex brachial valve, apparently more rounded cardinal extremities, a smaller ratio of height to width, and the margins around the ventral interarea more convex.

Occurrence.—Intervals 17, 20, 22, 23, 24, and 25, Sibley quarry.

GASTROPODA

A number of internal molds of gastropods have been found, but they are too poorly preserved to be identified even generically. Grabau lists the following species as coming from the Dundee of Sibley Quarry.

Name	Interval Sherzer	Author
Pleurotomaria (Pleurorima) lucina Hall	A, G	25, 23
Pleurotomaria (Euryzone?) hebe Hall	A, A–I	25, 25–20
Hormotoma (Hormotomina) maia (Hall)	I	20–21
Hormotoma desiderata Hall	upper	
Coelidium sp.	unknown	
Euomphalus (Pleuronotus) decewi Billings	upper beds	
Trochonema meekanum S. A. Miller (*T. tricarinatum* Meek)	I	20–21
Platyceras dumosum Conrad	A–D, etc.	25
Platyceras attenuatum Meek	unknown	
Platyceras carinatum Hall	unknown	
Callonema bellatulum Hall	unknown	

Platyceras bradleyi Bassett, n. sp.

(Plate 38, figures 5-6)

Description.—Shell, ventricose. Apex, minute, making about one or one-half closely enrolled volutions, below which it expands rapidly and becomes ventricose, spreading more on the left of the dorsum than on the right. Dorsum is marked by a rounded carina at the front, but in the earlier stages of growth the dorsum is subangular. In addition to the dorsal sinus there are two smaller sinuses, close together on the right side of the dorsum. Aperture oblique, circular in outline; peristoma, sinuous.

Surface marked by fine and coarse non-imbricating lines of growth.

Remarks.—This species differs from *P. carinatum* Hall in that the left side is more expanded than the right.

Occurrence.—Interval 17, Sibley quarry.

Platyceras keoughi Bassett, n. sp.

(Plate 38, figures 1-4, 8)

Description.—Shell, ventricose. Apex, minute, closely enrolled for about one volution, below which it expands rapidly becoming extremely ventricose, spreading more on the left than on the right of the dorsum. Dorsum, rounded in the earlier stages of growth, but develops a subangular carina when full grown. The swelling on the right side of the dorsum develops into a strong, rounded sinus. Many of the specimens show a halt in the growth before the development of the sinus on the right side. This may be seen especially well on the partially exfoliated specimen illustrated on Plate 38, figure 4. When the shell is preserved, this halting stage may be either faintly indicated or not at all.

Surface, marked by faint revolving striae, which are crossed by strong lines of growth.

Occurrence.—Intervals 17, 20, and 24, Sibley quarry.

Platyceras knappi Bassett, n. sp.

(Plate 38, figures 7, 9-11)

Description.—Shell, obliquely oval; apex, minute, rapidly but uniformly expanding a little more on the right of the dorsum than on the left. Dorsum, rounded. The right side shows faint indications of a broad sinus. Aperture, rounded; peristome, sinuous.

Surface, marked by closely arranged, undulating lines of growth. The shell of this specimen is well preserved and exhibits color markings. On each side of the center of the dorsum, and parallel to it, is a narrow, buff, color band, the one on the left side being about 0.5 millimeters in width, the one on the right nearly twice as broad. A third color band is faintly indicated on the broad sinus of the right side of the shell.

Only five other species of gastropods having color markings are recorded by A. F. Foerste[24] as coming from rocks of the Devonian system; only one species of *Platyceras* with color markings is listed by him.

Remarks.—This new species was found by Thomas Knapp, graduate student in geology at the University of Michigan, and has been named for him.

Occurrence.—Found in Sibley quarry, interval not known.

TRILOBITA

Proetus crassimarginatus (Hall)

(Plate 38, figures 12-17)

1843. *Calymene crassimarginata* Hall, Geology Fourth Dist., New York, p. 173.

1861. *Proetus crassimarginatus* Hall, New York St. Cab. Nat. Hist., 15th Ann. Rept., p. 72-73.

The specimens from the Dundee of Sibley quarry are like specimens from the Falls of the Ohio. They have a much thicker, more convex pygidium than the one imperfect specimen available for comparison from the type locality, Williamsville, N. Y. A comparison with the types may show that this form is a new species.

Occurrence.—Intervals 17, 20, 23, and 25, Sibley quarry; reported from Whitehouse quarry.

Proetus planimarginatus Meek

(Plate 39, figures 1-8)

1871. *Proetus planimarginatus* Meek, Acad. Nat. Sci. Philadelphia, Pr., p. 89; and *Paleont., Ohio,* vol. 1, pt. 2 (1873) pl. 23, figs. 3a, b.

1899. *Proetus curvimarginatus* Hall, (?) (*Proetus* sp. Grabau), Buffalo Soc. Nat. Sci., Bull., vol. 6, pt. 2, p. 316, fig. 261.

1909. *Proetus welleri* Stauffer, Ohio Geol. Surv., 4th ser., Bull. 10, p. 195, pl. 17, figs. 12, 13.

1913. *Proetus conicus* Grabau, Mich. Geol. and Biol. Surv., Publ. 12, geol. ser. 9, p. 361.

Remarks.—In 1871, Meek described *P. planimarginatus,* from the smooth cast of the lower surface of a pygidium found in Lucas County, Ohio. Grabau found a glabella in the Hamilton of Eighteen Mile Creek, New York, which he referred,

[24] A. F. Foerste: *The color patterns of fossil cephalopods and braciopods, with notes on gastropods and pelecypods,* Univ. Michigan, Contr. Mus. Paleont., vol. 3, no. 6 (1930) p. 118.

in 1899, to *P. curvimarginatus* Hall, but which, in 1913, he considered the same as the single cranidium from the Dundee limestone of the Sibley quarry in Michigan, upon which he based his species *P. conicus*. Stauffer found, near Venice, Ohio, a nearly complete enrolled specimen, preserving the outer surface of the test and part of one genal spine. This he described in 1909 as *P. welleri*. A cephalon from the Sibley quarry, preserving the free cheeks and genal spines, has a cranidium that is identical with that of *P. welleri* Stauffer. A study of the descriptions of *P. conicus* Grabau and the *P.* sp. which Grabau referred to *P. curvimarginatus* Hall, and the drawing of the *P.* sp. Grabau shows that these glabellae are identical with the glabella of the cephalon from Sibley. The surface of the pygidium of *P. welleri* Stauffer is identical with the surfaces of pygidia found in the Sibley quarry, which, when exfoliated, correspond with the description and the pictures of *P. planimarginatus* Meek, proving that these described species are the same. The pygidium described by Meek came from Sylvania, Lucas County, Ohio, which, undoubtedly, refers to the Silica quarry.

Occurrence.—Intervals 15, 17, 20, 21, and 23, Sibley quarry; Silica and Whitehouse quarries.

SELECTED REFERENCES

Ehlers, G. M., and Cooley, M. E.: *Discovery of a Hamilton fauna in southeastern Michigan,* Univ. Michigan, Contr. Mus. Paleont., vol. 2, no. 13 (1927) p. 231-236.

Foerste, A. F.: *The color patterns of fossil cephalopods and brachiopods, with notes on gastropods and pelecypods,* Univ. Michigan, Contr. Mus. Paleont., vol. 3, no. 6 (1930) p. 109-150, 5 pls.

Fuller, G. N.: *Geological reports of Douglass Houghton,* Michigan Historical Commission, Lansing (1928) 700 pages.

Grabau, A. W.: *Preliminary report on the fauna of the Dundee limestone, geological report on Wayne County, Michigan,* Michigan Geol. and Biol. Surv., Publ. 12, geol. ser. 9 (1913) p. 327-338.

——— and Sherzer, W. H.: *The Monroe formation of southern Michigan and adjoining regions,* Michigan Geol. and Biol. Surv., Publ. 2, geol. ser. 1 (1910) p. 42-54.

Houghton, Douglass: *Report of State Geologist,* Michigan Legislature, House Doc. no. 24 (1838).

———: *Second Annual Report of the State Geologist,* Michigan Legislature, Senate Doc. no. 12 (1839).

———: *Third Annual Report of the State Geologist,* Michigan Legislature, Senate Doc., vol 2, no. 7 (1840).

Hubbard, Bela: *Report of Bela Hubbard* in *Second Annual Report of the State Geologist,* Michigan Legislature, Senate Doc. no. 12 (1839).

———: *Report of Bela Hubbard* in *Third Annual Report of the State Geologist,* Michigan Legislature, Senate Doc., vol. 2, no. 7 (1840).

Kindle, E. M.: *The Devonian fossils and stratigraphy of Indiana,* Ind. Dept. Geol. and Nat. Res., 25th Ann. Rept. (1900) p. 529-579, 31 pls.

Lane, A. C.: *The geology of lower Michigan with reference to deep borings,* Mich. Geol. Surv., vol. 5, pt. 2 (1895) p. 25-26.

———: *Third Annual Report of the State Geologist,* Rept. State Board Geol. Surv. Michigan for 1901 (1902) p. 145, 151, 216, 219-220.

———: *Notes on the geological section of Michigan,* pt. 2, from the St. Peter's up, Rept. State Board Geol. Surv. Michigan for 1908 (1909) p. 69-71.

NATTRESS, THOMAS: *The Corniferous exposure in Anderdon,* Ontario Bur. Mines, 11th Rept. (1902) p. 123-127.

———: *The geological continuity of Essex and Kent counties, Ontario, and Monroe and Wayne counties, Michigan,* Mich. Acad. Sci., 9th Rept. (1907) p. 177-184.

———: *The extent of the Anderdon beds of Essex County, Ontario, and their place in the geological column,* Mich. Acad. Sci., 13th Rept. (1911) p. 87-97.

———: *Additional notes on the geology of the Detroit River area,* Mich. Acad. Sci., 14th Rept. (1912a) p. 109-114.

———: *Geology of the Detroit River area,* Mich. Acad. Sci., 21st Ann. Rept., vol. 21, pt. 1 (1912b) p. 281-287.

POHL, E. R.: *Devonian formations of the Mississippi basin,* Tenn. Acad. Sci., Jour., vol. 5, no. 2 (1930) p. 52-63.

ROMINGER, CARL: *Lower Peninsula* (1873-1876), Mich. Geol. Surv., vol. 3, pt. 1 (1876) p. 24-27.

SHERZER, W. H.: *Geological report on Monroe County, Michigan,* Mich. Geol. Surv., vol. 7, pt. 1 (1900) p. 35-42, 75-78, 226-228.

———: *Geological report on Wayne County, Michigan,* Mich. Geol. and Biol. Surv., Publ. 12, geol. ser. 9 (1913) p. 199-208.

SMITH, R. A.: *Mineral resources of Michigan,* Mich. Geol. and Biol. Surv., Publ. 21, geol. ser. 17 (1916) p. 248-249, 265-267.

STAUFFER, C. R.: *The Middle Devonian of Ohio,* Ohio Geol. Surv., Bull 10, 4th ser. (1909).

——: *The Devonian of southwestern Ontario,* Canada Geol. Surv., Mem. 34 (1915) p. 201-206.

STEWART, G. A.: *Fauna of the Silica shale of Lucas County,* Ohio Geol. Surv., Bull. 32, 4th ser. (1927).

WINCHELL, ALEXANDER: *First biennial report of the progress of the Geological Survey of Michigan,* Lansing (1861) 339 pages.

EXPLANATION OF PLATES

Plate 34

FOSSILS FROM THE DUNDEE LIMESTONE

Pinnatophyllum dundeense Grabau

Figure 1.—Lateral view of one of Grabau's cotypes, showing shape of corallum and contractions of epitheca. (15259*) Sibley quarry.

Figure 2.—Longitudinal section of a specimen identified by Grabau, showing depth of calyx and dissepiments. (15262) Sibley quarry.

Figure 3.—Calyx of another of Grabau's cotypes, showing cardinal septum at top, twisting of the septa at the center, and dissepiments. (15260) Sibley quarry.

Figure 4.—Transverse section of another corallum identified by Grabau, showing arrangement of septa. Cardinal septum at top. x 2. (15263) Sibley quarry.

Pholidops neali Bassett, n. sp.

Figure 5.—Exterior view of a ventral (?) valve. x 4. Holotype. (15201) Sibley quarry.

Figure 6.—Interior view of the holotype. x 4.

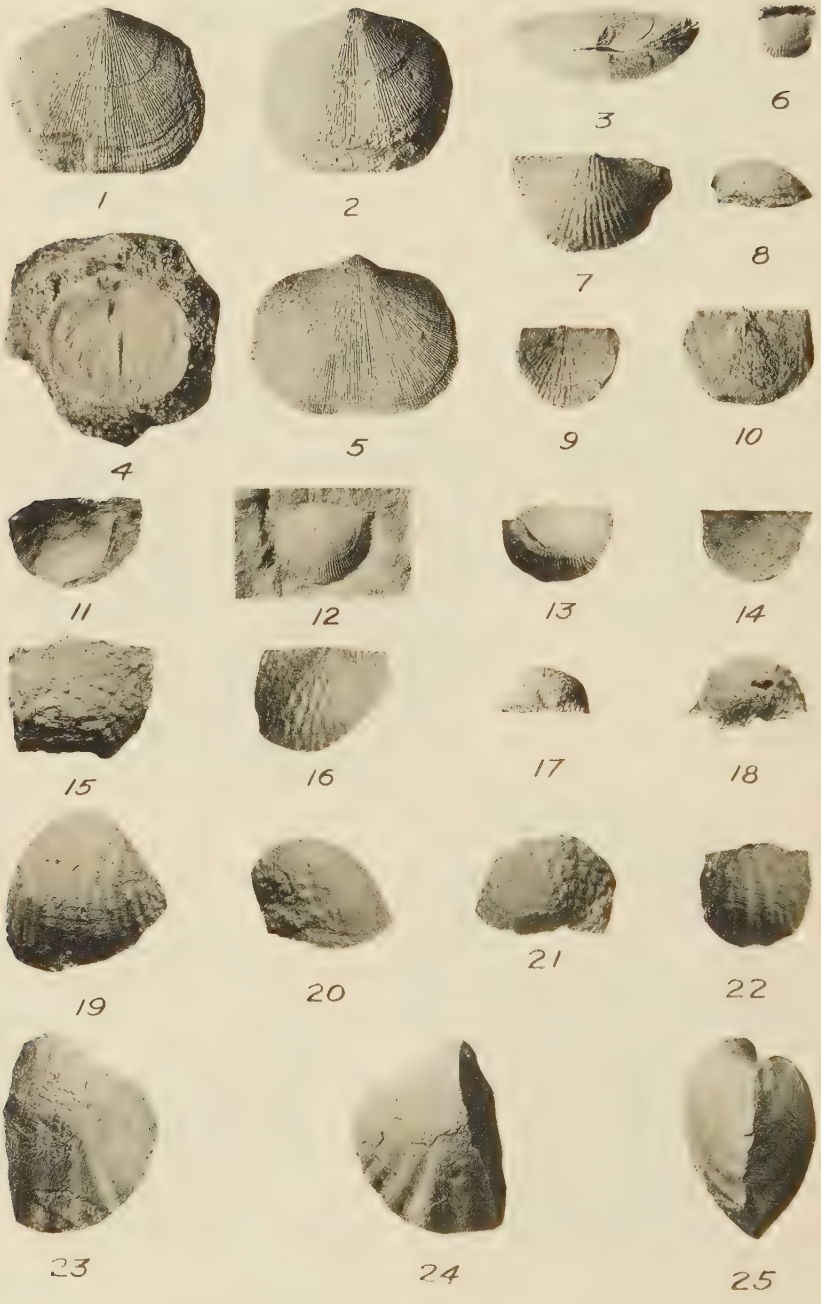
Figure 7.—Interior view of the holotype. x 16.

Pholidops hamiltonae Hall

Figure 8.—Interior of a valve. x 16. Plesiotype. (15291) Hamilton shales of Eighteen Mile Creek, New York. Gift from the Buffalo Museum of Science.

* Numbers in parentheses refer to University of Michigan collections.

FOSSILS FROM THE DUNDEE LIMESTONE



FOSSILS FROM THE DUNDEE LIMESTONE

PLATE 35

FOSSILS FROM THE DUNDEE LIMESTONE

Rhipidomella variabilis Grabau

FIGURES 1–3.—Dorsal, ventral, and posterior views of the neoholotype. (15200) Sibley quarry.

FIGURE 4.—Interior of a ventral valve, showing muscle scars. Neoparatype. (15193) Sibley quarry.

Schizophoria foleyi Bassett, n. sp.

FIGURE 5.—Ventral valve. Holotype. (15194) Sibley quarry.

Chonetes maconensis Bassett, n. sp.

FIGURE 6.—Ventral valve, showing spine bases along cardinal margin. Paratype. (15206) Sibley quarry.

FIGURE 7.—Ventral valve, showing presence of fine plications in middle part of valve and absence of plications on postero-lateral slopes. x 2. Holotype. (15203) Sibley quarry.

FIGURE 8.—Side view of specimen illustrated in figure 7, showing curvature of the valve. x 2.

FIGURE 9.—Exterior of a dorsal valve. x 2. Paratype. (15205) Macon Creek.

FIGURE 10.—Interior of a dorsal valve, showing cardinal process and muscle scars. Paratype. (15204) Macon Creek.

Chonetes sibleyensis Bassett, n. sp.

FIGURE 11.—Ventral valve, showing spines along cardinal margins. Holotype. (15195) Sibley quarry.

FIGURE 12.—Ventral valve, showing spines along cardinal margin. Paratype. (15857) Sibley quarry.

FIGURE 13.—Natural mold of the interior of a ventral valve. Paratype. (15186) Chert nodule, Sibley quarry.

FIGURE 14.—Exterior of a dorsal valve. Paratype. (15187) Macon Creek.

Etheridgina? spinosa Bassett, n. sp.

FIGURE 15.—Ventral valve, showing spines on postero-lateral slopes. x 2. Paratype. (15213) Interval 17, Sibley quarry.

FIGURE 16.—Interior of a dorsal valve. x 2. Paratype. (15217) Interval 17, Sibley quarry.

FIGURE 17.—Ventral valve, showing scar of attachment. Paratype. (4155) ?Dundee limestone, drift, Ann Arbor, Michigan.

FIGURE 18.—Posterior view of the specimen illustrated in figure 22, showing spines along cardinal margin and concentric arrangement of spines about scar of attachment.

FIGURES 19, 20, 21.—Ventral, side, and posterior views of the holotype. x 2. (15214) Interval 17, Sibley quarry.

FIGURE 22.—Exterior of a ventral valve. Paratype. (15215) Sibley quarry.

Pentamerella parva Bassett, n. sp.

FIGURES 23–25.—Ventral, dorsal, and lateral views of the holotype. x 2. (15196) Interval 21, Sibley quarry.

Plate 36

FOSSILS FROM THE DUNDEE LIMESTONE

Atrypa elegans (Grabau)

Figure 1.—Dorsal view of a young shell. Neoparatype. (15198) Interval 24, Sibley quarry.

Figure 2.—Dorsal view of a more mature shell. Neoparatype. (15167) Interval 24, Sibley quarry.

Figure 3.—Ventral view of a gerontic shell. Neoparatype. (15166) Interval 24, Sibley quarry.

Figures 4–5.—Ventral and dorsal views of an exfoliated shell, showing muscle scars and ovarian pittings. Neoparatype. (15192) Interval 24, Sibley quarry.

Figures 6–9.—Dorsal, ventral, lateral, and anterior views of the partially exfoliated neoholotype. (15180) Interval 24, Sibley quarry.

Figures 10–13.—Dorsal, ventral, lateral, and anterior views of a neoparatype. (15183) Interval 24, Sibley quarry.

Figures 14–15.—Dorsal and lateral views of a neoparatype, showing spires. (15199) Interval 24, Sibley quarry.

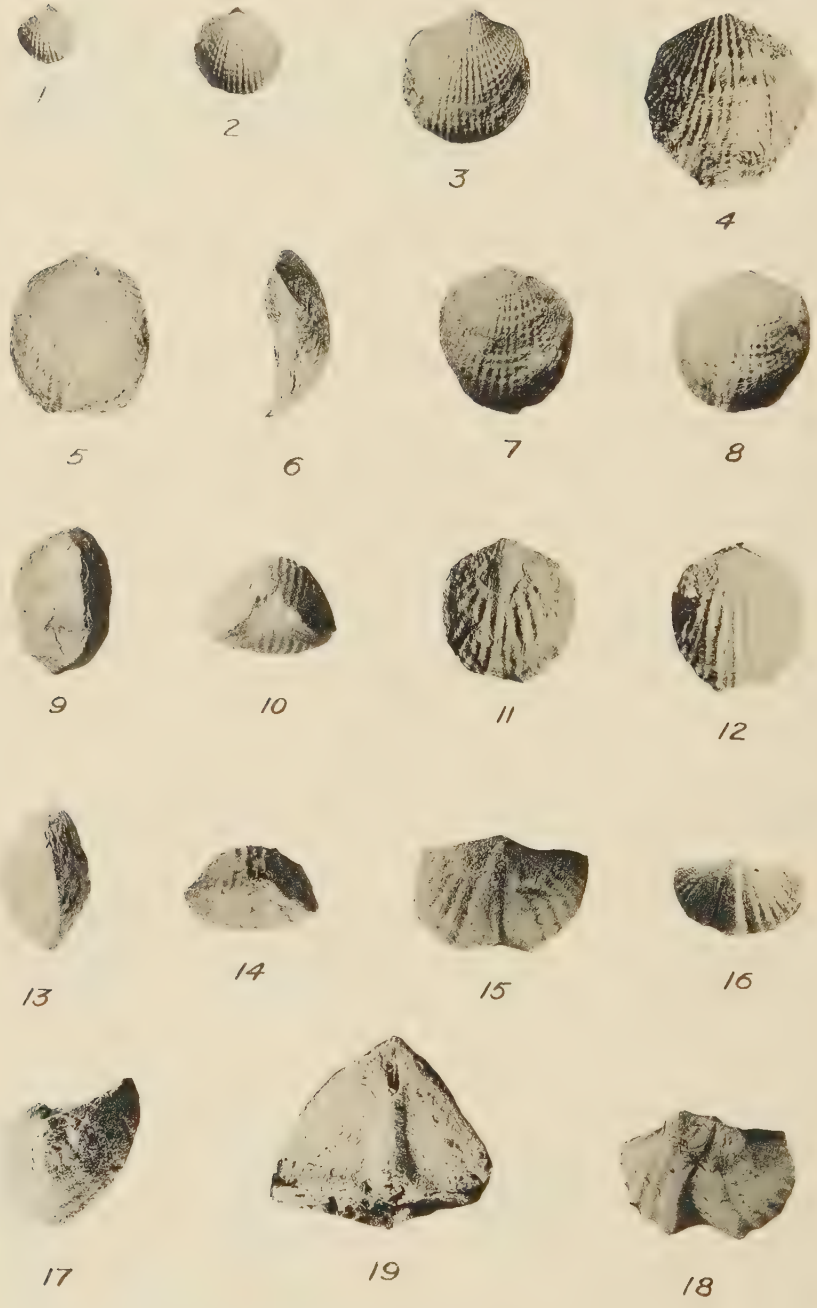
Atrypa elegans var. *gibbosa* Bassett, n. var.

Figures 16–19.—Ventral, dorsal, lateral, and anterior views of the holotype. (15179) Interval 24, Sibley quarry.

Figure 20.—Ventral valve. Paratype. (15182) Interval 24, Sibley quarry.

Figure 21.—Ventral valve, showing muscle scars. Paratype. (15191) Interval 24, Sibley quarry.

FOSSILS FROM THE DUNDEE LIMESTONE



FOSSILS FROM THE DUNDEE LIMESTONE

PLATE 37

FOSSILS FROM THE DUNDEE LIMESTONE

Atrypa costata Bassett, n. sp.

FIGURE 1.—Dorsal view of a young shell. Paratype. (15296) Sibley quarry.

FIGURE 2.—Dorsal view of another young shell. Paratype. (15181) Sibley quarry.

FIGURE 3.—Ventral view of a shell of average size. Paratype. (15165) Sibley quarry.

FIGURE 4.—Dorsal view of a large specimen, showing imbricating lines of growth. Paratype. (15190) Onondaga limestone, Amherstburg, Ontario.

FIGURE 5.—Ventral valve of a gerontic specimen. Paratype. (15178) Interval 25, Sibley quarry.

FIGURE 6.—Lateral view of specimen illustrated in figure 5, showing thickening of shell.

FIGURES 7–10.—Ventral, dorsal, lateral, and anterior views of the holotype. (15197) Sibley quarry.

Atrypa ehlersi Bassett, n. sp.

FIGURES 11–14.—Ventral, dorsal, lateral, and anterior views of the holotype. (15185) Interval 17, Sibley quarry.

Cyrtina hoffmeisteri Bassett, n. sp.

FIGURES 15, 17.—Ventral and lateral views of the holotype. x 2. (15211) Interval 17, Sibley quarry.

FIGURE 16.—Dorsal valve. x 2. Paratype. (15212) Interval 17, Sibley quarry.

FIGURE 18.—Ventral valve, showing twisted character of the beak due to an injury. Paratype. (15208) Interval 20, Sibley quarry.

FIGURE 19.—Interarea of a ventral valve. x 2. Paratype. (15210) Interval 15 or 17, Sibley quarry.

Plate 38

FOSSILS FROM THE DUNDEE LIMESTONE

Platyceras keoughi Bassett, n. sp.

Figures 1–3.—Spiral, dorsal, and apertural views of the holotype. (15285) Interval 17, Sibley quarry.

Figure 4.—Paratype, showing halt in growth. x 2. (15282) Interval 20, Sibley quarry.

Figure 8.—Spiral view of another paratype showing apertural edge. x 2. (15284) Interval 20, Sibley quarry.

Platyceras bradleyi Bassett, n. sp.

Figures 5–6.—Dorsal and spiral views of the imperfectly preserved holotype. (15281) Interval 17, Sibley quarry.

Platyceras knappi Bassett, n. sp.

Figure 7.—Spiral view of the holotype. (15270) Sibley quarry.

Figures 9–11.—Dorsal, umbilical, and spiral views of the specimen illustrated in figure 7, showing color bands. x 3.

Proetus crassimarginatus Hall

Figures 12–13.—Dorsal and posterior views of a pygidium. Plesiotype. (15129) J. H. Farmer collection. Sibley quarry.

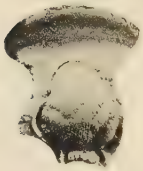
Figure 14.—Posterior view of the pygidium illustrated in figure 16.

Figure 15.—Glabella, probably belonging to this species. (15130) Interval 17, Sibley quarry.

Figure 16.—Dorsal view of a pygidium. Plesiotype. x 2. (15128) S. H. Perry collection. Sibley quarry.

Figure 17.—Dorsal view of a pygidium. Plesiotype. x 2. (15127) Sibley quarry.

FOSSILS FROM THE DUNDEE LIMESTONE



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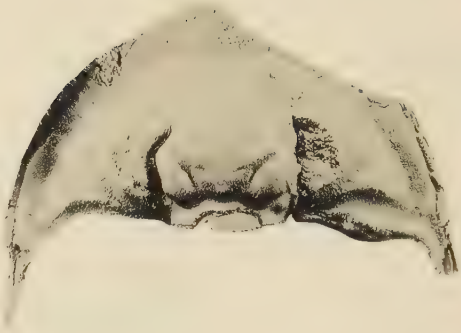

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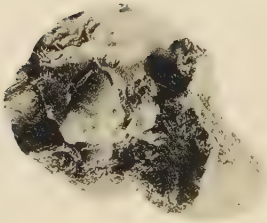

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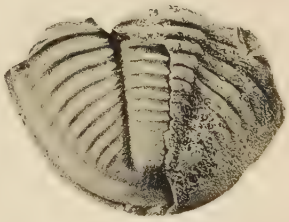

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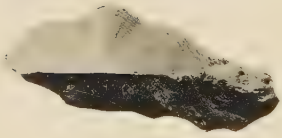

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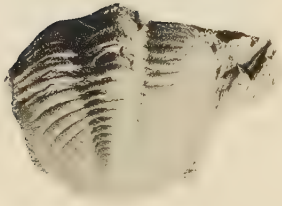

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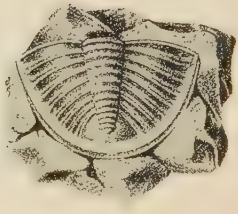

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FOSSILS FROM THE DUNDEE LIMESTONE

PLATE 39

FOSSILS FROM THE DUNDEE LIMESTONE

Proetus planimarginatus Meek

FIGURE 1.—Glabella and upturned frontal border of an incomplete cephalon. Plesiotype. x 2. (15126) Sibley quarry.

FIGURE 2.—Nearly complete cephalon. Plesiotype. x 2. (15133) Interval 20, Sibley quarry.

FIGURE 3.—Dorsal surface of a pygidium. Plesiotype. x 2. (15122) Sibley quarry.

FIGURE 4.—Partially exfoliated pygidium. Plesiotype. x 2. (15125) Sibley quarry.

FIGURES 5–7.—Cephalon and posterior and dorsal views of the pygidium of the holotype of *Proetus welleri* Stauffer. x 2. (No. 16976, Ohio State University collection) Columbus limestone. Venice, Ohio.

FIGURE 8.—Copy of the original illustration of *Proetus planimarginatus* Meek, Plate XXIII, Paleontology of Ohio, volume I, 1871. Columbus limestone. Sylvania, Lucas County, Ohio.